

Know the following terms:

- Polynomial
- Standard Form
- Degree of a Polynomial
- Degree of a Term
- Monomial
- Binomial
- Trinomial

### Steps to Add or Subtract Polynomials in ( )

1. Write out the original problem. (W.O.P.)
2. Multiply the sign in front of each ( ) times all terms inside of ( ) to clear ( ).
3. Put like terms together in descending degree order.
4. Combine coefficients of like terms.

### Example $(8x^2 - 11x + 2) - (4x^2 - 3x + 10)$

In this problem we are subtracting terms in one ( ) from another. The 1<sup>st</sup> ( ) has no sign in front so it is seen as a plus and the second ( ) has a minus. You can think of it as multiplying a +1 times a ( ) or a -1 times a ( ).

Problem	Notes
$(8x^2 - 11x + 2) - (4x^2 - 3x + 10)$	<i>Original Problem</i>
$= 8x^2 - 11x + 2 - 4x^2 + 3x - 10$	<i>Multiply sign in front times each term inside to clear ( ).</i>
$= 8x^2 - 4x^2 - 11x + 3x + 2 - 10$	<i>Move like terms together.</i>
$= 4x^2 - 8x - 8$	<i>Combine coefficients of like terms.</i>

### Steps to Multiply Polynomials

1. W.O.P.
2. If a ( ) is raised to a power and if the ( ) has multiple terms, expand the ( ) by explicitly writing the ( ) times itself as many times as the exponent.
3. Take each term in the first ( ) and multiply it times each term in the next ( ).
4. Make sure you watch the sign in front of each term that is being multiplied.
5. The actual multiplication is accomplished by doing the following:
  - a. Multiply the coefficients together and their signs.
  - b. Multiply the same variables together by adding their exponents and putting the result on the variable.
  - c. Multiply unlike variables together by putting the variables together in alphabetical order and leave exponents alone.
6. Put like terms together in descending degree order.
7. Combine coefficients of like terms.

**Note: Examples to multiply on next page.**

**Example 1:  $3x(7x^3 - 2x^2 + 5x - 20)$** 

In this problem we will be multiplying the  $3x$  times all of the terms inside of the ( ). There will be four multiplications.

$$\begin{aligned} & 3x(7x^3 - 2x^2 + 5x - 20) \\ &= 3x(7x^3) + 3x(-2x^2) + 3x(5x) + 3x(-20) \\ &= 21x^4 - 6x^3 + 15x^2 - 60x \end{aligned}$$

NOTE: It is optional to show the actual distribution, you can go directly to the step with:

$$21x^4 - 6x^3 + 15x^2 - 60x$$

**Example 2:  $(x + 2)(x^3 + 4x^2 - 3x + 10)$** 

In this problem we have two terms by four terms so there will be a total of eight multiplications. In the first ( ) we will multiply the 1<sup>st</sup> term "x" time each term in the second ( ). We will then multiply the term "2" times each term in the second ( ).

$$\begin{aligned} & (x + 2)(x^3 + 4x^2 - 3x + 10) \\ &= x^4 + 4x^3 - 3x^2 + 10x + 2x^3 + 8x^2 - 6x + 20 \end{aligned}$$

Now, move like terms together:

$$= x^4 + 4x^3 + 2x^3 - 3x^2 + 8x^2 + 10x - 6x + 20$$

Finally, combine coefficients of like terms.

$$= x^4 + 6x^3 + 5x^2 + 4x + 20$$

**Example 3:  $(x + 5y)(7x + 3y)$** 

In this problem we will multiply two terms by two terms for a total of four multiplications. Some of the multiplications have unlike variables and the resulting product will just have the variables by each other.

$$\begin{aligned} & (x + 5y)(7x + 3y) \\ &= 7x^2 + 3xy + 35xy + 15y^2 \\ &= 7x^2 + 38xy + 15y^2 \end{aligned}$$

**Example 4:  $(x + 6y)^2$** 

In this problem we need to expand the ( ) because of the power of 2.

$$\begin{aligned} & (x + 6y)^2 \\ &= (x + 6y)(x + 6y) \\ &= x^2 + 6xy + 6xy + 36y^2 \\ &= x^2 + 12xy + 36y^2 \end{aligned}$$